TO: John T. Litton, P.E., Director

Division of Waste Management

Bureau of Land and Waste Management

THRU: David Scaturo, P.E., P.G., Manager

Corrective Action Engineering Section

FROM: Jerry Stamps, Engineer Associate

Corrective Action Engineering Section

DATE: December 19, 2003

RE: Evaluation of Charleston Naval Complex Status Under

The RCRA Info Corrective Action Environmental Indicator

Event Codes (CA725 and CA750) EPA ID No. SC0 170 022 560

CC: Mansour Malik, RCRA Hydrogeology Section

Caron Falconer, EPA Region 4 Narindar Kumar, EPA Region 4 Dann Spariosu, EPA Region 4 Rob Harrell, P.E., SOUTHDIV

I. PURPOSE OF MEMO

This memo is written to formalize an evaluation of the status of Charleston Naval Complex (CNC) in relation to the following corrective action event codes defined in the Resource Conservation and Recovery Act Information System (RCRA Info):

- 1.) Current Human Exposures Under Control (CA725),
- 2.) Migration of Contaminated Groundwater Under Control (CA750).

Concurrence by the Director of the Division of Waste Management is required prior to entering these event codes into RCRA Info. Your concurrence with the interpretations provided in the following paragraphs and the subsequent recommendations is satisfied by dating and signing at the appropriate location within Attachment 1.

II. HISTORY OF ENVIRONMENTAL INDICATOR EVALUATIONS AT THE FACILITY AND REFERENCE DOCUMENTS

This particular evaluation is the fourth evaluation for CNC. The earlier evaluations were dated September 18, 1997, April 11, 2002 and September 18, 2003. The April 2002 evaluation is attached. The results of the earlier evaluations, with the exception of the September 18, 2003 evaluation, recommended that CA725 NO and CA750 NO be entered into RCRA Info (then RCRIS) due to the fact that human exposures to contamination were not currently controlled for soil, groundwater, and surface water, and also due to the uncontrolled migration of contaminated groundwater at the facility. The September 18, 2003 evaluation recommended YES for AC725 be entered into RCRA Info.

The results of this evaluation are based on information obtained from the documents identified in Attachment 4:

III. FACILITY SUMMARY

The Charleston Naval Complex was closed on April 1, 1996 and was renamed the Charleston Naval Complex (CNC). The CNC consists of 1,588 acres and is located along the Cooper River in Charleston County, South Carolina. The CNC is divided into 12 zones (alphabetically from Zone A to K) to facilitate RCRA corrective action processes and for conveyance of the property for redevelopment. The CNC operated approximately 18 major industrial shops. The hazardous waste generated primarily included paint waste, waste solvents, boiler cleaning solutions, acids, sludge from metal plating at the ship pretreatment facility, and small quantities of mixed waste (radiologically contaminated hazardous waste).

The CNC corrective action program is governed by the RCRA Permit (SC0 170 022 650), issued by the SCDHEC on August 17, 1998 (last modified April 25, 2003). Appendix A of the referenced permit lists the 196 solid waste management units (SWMUs) and 209 areas of concern (AOCs) identified at the CNC that are in various stages of corrective action.

The EPA generated a National Corrective Action Priority System (NCAPS) ranking for the site in March of 1992. The result of this ranking was a high rating. SCDHEC conducted an environmental indicator (EI) evaluation of the CNC on September 18, 1997. This evaluation examined plausible human exposure, groundwater migration, surface water contamination, and whether controls are in place to prevent exposure at the facility.

IV. CONCLUSION FOR CA725

As outlined in Attachment 1, there are currently no complete human health exposure pathways to contamination at the Charleston Naval Complex. This conclusion is based on current conditions and data, and is summarized for soil, sediment, groundwater, surface water, and air media below.

Soil and Sediment

As stated above, CNC is divided into 12 Zones. Zone E is designated for industrial re-use. Industrial re-use will be maintained by Land Use Controls (LUCs). Investigations at many sites located within Zone E have not resulted in chemical concentrations greater than the EPA Region III Industrial RBC or background, as appropriate. Sites with contamination greater than the Industrial RBC have been remediated to industrial standards via interim measures. With the exception of the landfill, site investigations for the remainder of the base have been conducted with respect to the EPA Region III Residential RBCs. Based upon the information available to date, any contamination in excess of the Residential RBCs or background, have been remediated. It is anticipated that the landfill will be subject to industrial re-use; therefore, the landfill investigation was conducted with respect to industrial standards. There is no known direct exposure to the waste material contained within the landfill, nor are there any Industrial RBC exceedances in the current soil cover. Consequently, the soil and sediment at CNC are not expected to be a threat to human health.

Groundwater

Groundwater is not currently used as a drinking water source, nor is it used for irrigation. The Navy currently has a dig permit process in place to prevent the unauthorized installation of wells and land disturbance. Consequently, the groundwater at CNC does not pose a threat to human health.

Surface Water

Surface water sampling at various SWMUs/AOCS throughout the base has not resulted in contamination above the relevant human health action levels. Therefore, surface water at CNC does not pose a threat to human health.

Air

Releases to air from soil, groundwater, sediments, and/or surface water contaminated by SWMUs or AOCs at CNC are not known to have occurred or be occurring above relevant action levels.

Based on the information provided above, it is recommended that CA725 YE be entered into RCRA Info for the CNC.

V. CONCLUSION FOR CA750

Shallow, intermediate, and deep zones of the surficial aquifer had detections of metals and solvents above their respective Maximum Contaminant Levels (MCLs). Major areas affected include the west boundary (SWMU 39) of the CNC, which is adjacent to a marsh and close to a residential area, AOC 607 in Zone F, SWMU 196 in Zone H which discharges into Shipyard Creek, and the Naval Annex property. Based upon the extensive

characterization of these groundwater plumes, the implementation of Interim Measures, and the currently ongoing Long-Term Monitoring, it is recommended that CA750 YES be entered into RCRA Info for CNC.

VI. SUMMARY OF FOLLOW-UP ACTIONS (Discussion of What is Needed to Get to Yes, with EI Interim Milestone Schedule)

A. CA750 – Groundwater data was collected to demonstrate that contaminated groundwater is not migrating. This was accomplished by collecting groundwater samples from existing wells, installing new wells as necessary, or implementing measures to prevent further migration.

SWMU/AOC Number	Activities (Events as Defined in RCRIS)	Activity CA RCRIS Event Code	Scheduled Date (QTR & FY)	EI Code (725/750)	Remarks
39	RFI Approved, Stabilization Measure Implemented	CA200, CA 600	6/18/99, 12/11/02	750	This plume has been extensively characterized and interim measures have been implemented to address the source areas. Additionally, long-term monitoring is in place to ensure the plume is not migrating. The potential discharge to surface water is not believed to result in surface water concentrations that would be considered significant.
25/70	RFI Approved, Stabilization Measure Implemented	CA200, CA 600	4/2/03, 12/11/02	750	Given the relatively flat topography combined with the reduced infiltration (this area is paved), it is expected that the groundwater flow velocity is relatively low. Data from wells associated with downgradient AOCs indicate that the chromium plume is confined. AOC 561 is included in the LTM program to ensure plume migration is not occurring.
65	RFI Approved, Stabilization Measure Implemented	CA200, CA 600	8/27/03, 12/11/02	750	Nearby wells have contaminant concentrations below the corresponding MCLs. The extent of the contamination appears to be limited.
607	IM Plan Approved, Stabilization Measure Implemented	CA630, CA 600	4/12/01, 12/11/02	750	This plume has been extensively characterized and interim measures have been implemented to address the source areas. Additionally, long-term monitoring is in place to ensure the plume is not migrating.
196	RFI Report Received, Stabilization Measure Implemented	CA190, CA 600	11/22/02, 12/11/02	750	This plume has been extensively characterized and interim measures have been implemented to address the source areas. Additionally, long-term monitoring is in place to ensure the plume is not migrating. Based upon current surface water data, the discharge to surface water is not considered significant.
166	RFI Report Received, Stabilization Measure Implemented	CA190, CA 600	1/15/02, 12/11/02	750	This area has been investigated extensively. A pilot study is on going to evaluate the feasibility of zero-valent iron injections as a means of source treatment. DPT located to the southeast indicates chlorinated solvents below MCLs, thus, representing the leading edge of the plume. Additionally, a permanent well will be installed to the southwest of the plume. This EI

					may need to be re-evaluated pending the results from this well.
8	RFI Approved, Stabilization Measure Implemented	CA200, CA 600	4/9/03, 12/11/02		An IM was conducted to remove oil-contaminated soil. Periodic removal of free product from the standpipes is on going. No COCs identified in the CMS were detected in the latest round of sampling. SWMU 8 is included in the LTM program to ensure plume migration is not occurring.
9	CMS Report Received, Stabilization Measure Implemented	CA334, CA 600	3/3/03, 12/11/02		Long-term monitoring is in place to ensure contamination is not migrating for the landfill.
17	RFI Report Received, Stabilization Measure Implemented	CA190, CA 600	8/8/01, 12/11/02		The free product plume does not appear to migrating. The data indicate that the chlorobenzene and benzene plumes have remained stable. In 2002, the downgradient wells were non-detect for COCs. SWMU 17 is included in the LTM program to ensure plume migration is not occurring.
561	RFI Approved, Stabilization Measure Implemented	CA200, CA 600	10/24/02, 12/11/02		Downgradient wells indicate that the plume is stabilized. All detections of chlorobenzene in the sentry wells are well below the MCLs. AOC 561 is included in the LTM program to ensure plume migration is not occurring.
613	RFI Approved, Stabilization Measure Implemented	CA200, CA 600	10/24/02, 12/11/02		DPT collected just outside of Building 255 (downgradient of the plume) indicates that the chlorinated solvent plume is not migrating. AOC 613 is included in the LTM program to ensure plume migration is not occurring.
617	CMS Report, Stabilization Measure Implemented	CA350, CA 600	5/20/02, 12/11/02		There are numerous wells and DPT downgradient of the zinc hotspot with zinc concentrations below the MCLs. The high zinc concentrations appear to be confined to a relatively small area. AOC 617 is included in the LTM program to ensure plume migration is not occurring
722	Stabilization Measure Implemented	CA 600	12/11/02		Source area investigation is on going; however, wells are in place to monitor the migration of the contamination. This site is included in the long-term monitoring program.
	Migration of Contaminated Groundwater Under Control	CA750	12/31/03	750	Revised EI Memorandum

VII. LEVEL OF CONFIDENCE IN REACHING A POSITIVE EI EVALUATION AND MAJOR ISSUES

The Department believes that a YES determination for both CA725 and CA750 is appropriate based upon the data available to date.



2600 Bull Street Columbia, SC 29201-1708

TO:

John T. Litton, P.E., Director 12/29/2003

Division of Waste Management

Bureau of Land and Waste Management

THRU:

David Scaturo, P.E., P.G., Manager

Corrective Action Engineering Section

FROM:

Jerry Stamps, Engineer Associate

Corrective Action Engineering Section

DATE:

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		Migration of Contaminated Groundwater Under Control	CA750	12/31/03	750	Revised EI Memorandum

VII. LEVEL OF CONFIDENCE IN REACHING A POSITIVE EI EVALUATION AND MAJOR ISSUES

The Department believes that a YES determination for both CA725 and CA750 is appropriate based upon the data available to date.

ATTACHMENT 1

Documentation of Human Health (CA725) Environmental Indicator Determination

September 16, 2003

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA725)

Facility Name:

Charleston Naval Complex

Facility Address:

PO BOX 190010

North Charleston, South Carolina 29406

Facility EPA ID#:

SC0 170 022 560

Updated:

September 16, 2003

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g. from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)) been considered in this EI Determination?

Yes.

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be "**contaminated**" above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs, or AOCs)?

Media	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			Cr ⁺⁶ ,TCE, Zn, As, Pb, PaH's
				see comment (1)
Air (Indoors)		X		See comment (2)
Surface Soil (<2ft)	X			PaH's, Pb, As, Zn
Surface water	X			See comment (3)
Sediment	X			Cr ⁺⁶ , TCE, Zn, As, Pb
				see comment (1)
Subsurf. Soil (>2ft)	X			Cr ⁺⁶ , TCE, Zn, As, Pb
				See comment (1)
Air (Outdoors)		X		See comment (4)

Rationale and Reference(s):

Comment 1. The key contaminant listing for groundwater, surface soils, sediments, and subsurface soils is not inclusive. These are the primary contaminates. Each SWMU and AOC has a separate list of Contaminants of Potential Concern (COPCs) and Contaminants of Concern (COCs).

Comment 2. Testing conducted during occupation of Building 225 indicates that the indoor air is below acceptable risk-based criteria at Building 225. The use of

BLDG 225 as a dwelling is now prohibited by deed restriction. All other buildings that may be over or near subsurface contamination are industrial or commercial buildings. Please see the attached Indoor Air Evaluation.

Comment 3. While operational Charleston Naval Complex was in compliance with its NPDES permit.

Comment 4. Charleston Naval Complex does not have any regulated air emission sources

References. See attachment 1.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonable expected under the (land-and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table Potential **Human Receptors** (Under Current Conditions)

Contaminated	Residents	Workers	Day-	Construction	Trespassers	Recreation	Food
Media			Care				
Groundwater	No	No	No	Yes	No	No	No
Air (indoors)	No	No	No	No	No	No	No
Soil (<2ft)	No	Yes	No	Yes	Yes	No	No
Surface water	No	No	No	No	No	No	No
Sediment	No	No	No	No	No	No	No
Soil (>2)	No	No	No	Yes	No	No	No
Air (outdoors)							

Food production is not currently practiced at CNC. Fishing advisories, if needed, are issued by the South Carolina Department of Natural Resources (SCDNR).

Rationale and References:

<u>Groundwater</u>: Groundwater is not used as a potable water source. Potable water is provided by the Charleston Commissioners of Public Works from other sources. Therefore only construction worker are exposed to the superficial aquifer. DHEC regulated deep well are used for turf irrigation. The water from these well is from a deep aquifer. Water quality testing is required by DHEC.

Air (indoors): The potential for indoor air pollution from RCRA Corrective Action source was evaluated during the RCRA Facility Investigation (RFA). Only one inhabitable dwelling, BLDG 225, was identified with the potential for indoor air pollution above risk-based criteria. Building 225 is currently unoccupied and its use as an inhabitable dwelling is prohibited by deed restriction. Please see the attached Indoor Air Questionnaire.

<u>Surface Soil (<2ft)</u>: The surface soils contamination is limited largely to the industrial areas of CNC. The exposure pathway is broken by fencing of the industrial areas, limiting the Day-Care to an enclosed (by fence) area in a

residential area. The areas that are not fenced separately are isolated by location such as the dredge management area. Furthermore, it should be noted that Interim Measures are currently ongoing to remove contaminated surface soil. Therefore, only construction workers, trespassers, and workers have a reasonable pathway for exposure

<u>Surface water:</u> The surface waters adjacent to CNC are regulated by DHEC. CNC discharges, when CNC was active, were control by a NPDES permit. The surface waters adjacent to CNC are not suitable for swimming or bathing, due to ocean going ship traffic, ship construction, etc.

<u>Sediments:</u> The surface waters adjacent to CNC are not suitable for swimming or bathing, due to ocean going ship traffic, ship construction, etc; therefore, there is not a complete exposure pathway to sediments.

<u>Subsurface soils</u>: Only construction workers have a reasonable exposure to contaminated subsurface soils.

<u>Air (outdoors):</u> There are no active air emission sources from the US Navy at CNC.

Can the **exposure** from any of the complete pathways identified in #3 be reasonably expected to be "**significant**" (i.e., potentially "unacceptable" because exposure can be reasonably expected to be: 1) greater in magnitude (intensity, frequency, and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above he acceptable "levels") could result in the greater acceptable risk)?

If <u>NO</u> (exposure can not be reasonable expected to be significant (i.e., potentially "unacceptable") for any complete pathway) – skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination: (identified in #3) are not expected to "be significant".

If <u>YES</u> (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) — continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant.

If unknown (for any complete pathway) – skip to #6 and enter "IN" status code.

Rationale and Reference(s):

Exposure pathways are complete only for the construction worker, the trespasser, and worker. For the Construction worker the complete exposure pathways are for groundwater, surface soils and subsurface soils. For the trespasser the complete exposure pathway is for surface soils. The worker is reasonably expected to be exposed to only surface soils.

Construction worker exposure to groundwater, surface soils, and subsurface soils is control by:

All construction work in areas that are known or suspect SWMUs or AOCs requires Navy approval, in writing, before the work begins. Part of the approval process includes identifying known and suspected areas of contamination, listing the suspected contamination, and stating how exposure to the contaminant will be controlled (i.e., personal protection equipment (PPE), engineering controls, etc.)

All users of properties that are being re-used by either license or lease have been notified in the Environmental Baseline Survey (EBS), that is part of license or lease agreement of the SWMUs or AOC within one-quarter mile of the property. Digging and other restrictions in the license or lease agreement prohibit the disturbing of the groundwater, surface soils, and subsurface soils without Navy approval, in writing. The approval process requires the property user to describe how exposures to the known or suspect contaminates will be controlled.

Therefore, the construction worker exposure is not considered significant.

Trespasser exposure to surface soils is controlled by:

All of CNC is fenced and patrolled by security guards. Access to CNC is limited during normal working hours to those without a specific work location.

Areas with significant contaminated soils within CNC are further isolated by fences, groundcover such as turf grasses, roads, parking lots, and building foundations.

Therefore, the trespasser exposure to surface soils is not considered significant.

Worker exposure to surface soils is controlled by:

Areas with significantly contaminated soils within CNC are isolated by fences, groundcover such as turf grasses, roads, parking lots, and building foundations.

Furthermore, given the rapid pace of site remediation at the Charleston Naval Complex (CNC) and on-going interim measures to remove

contaminated surface soil, worker exposure to contaminated surface soil is not expected to be significant.

Therefore, the worker exposure to surface soils is not considered significant.

Check the appropriate RCRIS status codes for the Current Human Exposures 6. Under Control EI event code (CA 725), and obtain Supervisor (or appropriate Manager) signature and the date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

> XXX YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to the "Under Control" at the Charleston Naval Complex facility, EPA ID# SC0 170 022 560, located at North Charleston, South Carolina under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes.

NO - "Current Human Exposures" are NOT "Under Control."

IN- More information is needed to make a determination.

Completed by

erry Stampe, Engineer Associate

Corrective Action Section

South Carolina Department of Health and Environmental

Date 9/24/03

Date 9/24/03

Control

Supervisor

Davil Scaturo

David Scaturo, Manager

Corrective Action Section

South Carolina Department of Health and Environmental

Control

Locations where References may be found:

Southern Division, Naval Facilities Engineering Command

Caretaker Site Office

1895 Avenue F

North Charleston, South Carolina

Contact telephone and E-mail

US Navy
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ATTACHMENT 1A

Documentation of Groundwater Migration (CA750) Environmental Indicator Determination

December 19, 2003

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Address: PO BOX 190010 North Charleston, South Carolina 29406	
Facility EPA ID#: SC0 170 022 560	
1. Has all available relevant/significant information on known and reasonably su releases to the groundwater media, subject to RCRA Corrective Action (e.g. fi Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)) been considered in this EI Determination?	rom
\underline{XXX} If yes – check here and continue with #2 below.	
If no – re-evaluate existing data, or	
If data are not available, skip to #8 and enter "IN" (more information n status code.	eeded)
Is groundwater known or reasonably suspected to be " contaminated " above appropriately proactive "levels" (i.e., applicable promulgated standards, as we other appropriate standards, guidelines, guidance, or criteria_ from leases subjected RCRA Corrective Action? Anywhere at, or from, the facility	ll as
XXX If yes – continue after identifying key contaminates, citing appropriate "levels," and referencing supporting documentation	
If no – skip to #8 and enter "YE" status code, after citing appropriate "and referencing supporting documentation to demonstrate that groundwater is "contaminated".	levels," not
If unknown – skip to #8 and enter "IN" status code.	
Rationale and Reference (s)	٠.

¹ "Contamination" and "contaminated" describes media containing contaminates (in any form, NAPL, and or/dissolved, vapors, or solids that are subject to RCRA) in concentration in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

See Groundwater Monitoring and Well Inspection Work Plan, October 2002, CH2M-Jones. South Carolina Department of Health and Environmental Control letter 11 December 2002

3.	groun	Has the migration of contaminate groundwater stabilized (such that contaminated groundwater is expected to remain within "existing are of contaminated groundwater".						
	XXX	If yes-continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurements/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area: of groundwater contamination).						
		If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination") – skip to #8 and enter "NO" status code, after providing an explanation.						
	Mark Andrews Augus	If unknown – skip to #8 and enter "IN" status code.						
	Ration	ale and Reference (s):						

A YES determination is appropriate for CA 750 based upon the extensive investigation that that has taken place for each of the sites at the Charleston Naval Complex (CNC) and the fact the a long-term monitoring program is in place. The specifics for each site are discussed in the EI Evaluation Memorandum.

² "existing area of contamination groundwater" is an area (with horizontal and vertical dimension) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "groundwater" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

		4. Does "contaminated" groundwater discharge into surface water bodies?
	XXX	If yes – continue after identifying potentially affected surface water bodies.
		If no - skip to #7 (and enter a "YE" status in #8, if #7 = yes) after providing an explanation and/or referencing document in supporting that ground water "contamination" does not enter surface water bodies.
		If unknown – skip to #8 and enter "IN" status code.
	Ratio	nale and Reference(s)
		Contaminants from SWMU 196 are flowing toward the Shipyard Creek.
		The potential exists that contamination from SWMU 39 is discharging into Noisette Creek.
5.	"insign into some there contain unacc	discharge of "contaminated" groundwater into surface water considered to be gnificant" (i.e., the maximum concentration ³ of each contaminant discharging urface water is less than 10 times their appropriate groundwater "level," and are no other conditions (e.g., the nature, and number, of discharging minants, or environmental setting), which significantly increase the potential for eptable impacts to surface water, sediments, or eco-systems at these intrations)?
		If yes – ship to #7 (and enter "YE" status code in #8 if #7=yes), after documenting: 1) the maximum known or reasonably suspected concentration of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-systems.
	XXX	If no- (the discharge of "contaminated" groundwater into surface water is potentially significant - continue after documenting: 1) the maximum known or reasonably suspected concentration of <u>each</u> contaminated discharge above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations greater than 10 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

³ As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hypothetic) zone.

" status code in #8.
,

Rationale and Reference(s):

Based upon the surface water and groundwater data collected to date there is no reason to believe that any contamination discharging to surface water bodies should be considered significant. Additional discussion of SWMUs 39 and 196 are provided in the EI Evaluation Memorandum.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments, or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented⁴)?

incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-system), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater: OR 2) providing or referencing an interim-assessment⁵, appropriate to the potential for impact, that shows that discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-system, until such time when full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

XXX If yes - continue after either: 1) identifying the final Remedy decision

If no – (the discharge of "contaminated" groundwater can not be shown to be "currently acceptable") – skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

____ If unknown – skip to #8 and enter "IN" status code.

Rationale and Reference(s):

The surface water bodies are currently being evaluated under a zone-wide approach (Zone J). Based upon currently available information, there is no reason to believe that the discharge to surface water bodies should be considered significant.

⁴ Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

⁵ The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface water, sediments, or eco-systems.

7.	Will groundwater monitoring /measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or Vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"								
	XXX	If yes – continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."							
		If no – enter "NO" status code in #8.							
		If unknown – enter "IN" status code in #8.							
	Ratio	Rationale and Reference(s)							
	EI Ev Facili Opera These	advater contamination exists at various locations. Please the Section VI of the aluation Memorandum for specifics regarding these sites. At each site a RCRA ty Investigation (RFI) has been conducted. In addition, a facility wide ation and Maintenance Plan for groundwater monitoring has been submitted. It documents provide the data necessary to estimate the nature and extent of the dwater contamination.							
8.	Groun approp	the appropriate RCRIS status codes for the Migration of Contaminated adwater Under Control EI event code (CA 750), and obtain Supervisor (or priate Manager) signature and the date on the EI determination below (and appropriate supporting documentation as well as a map of the facility):							
	XXX	YE – Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Migration of Contaminated Groundwater" are expected to the "Under Control" at the <u>Charleston Naval Complex</u> facility, EPA ID# <u>SC0 170 022 560</u> , located at <u>North Charleston, South Carolina</u> under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes.							
		NO - "Current Human Exposures" are NOT "Under Control."							
		IN- More information is needed to make a determination.							

Completed by:

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Engineer Associate

South Carolina Department of Health and Environmental Control

Supervisor:

Date 12-22-03

Date 2-22-03

David Scaturo, P.E., P.G.

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ATTACHMENT 2

Environmental Indicator Evaluation

April 11, 2002

Project Schedule for Meeting Environmental Indicators April 11, 2002

I. Basic Information

Name and I.D. No.	Location (City or Town)	Date of Latest EI Memo	CA 725 Decision	CA 750 Decision
Charleston Naval Complex SC0 170 022 560	Charleston, SC	September 18, 1997	NO	NO

II. Brief Facility Background

The Charleston Naval Base was closed on April 1, 1996 and was renamed the Charleston Naval Complex (CNC). The CNC consists of 1,588 acres and is located along the Cooper River in Charleston County, South Carolina. The CNC is divided into 12 zones (alphabetically from Zone A to K) to facilitate RCRA corrective action processes and for conveyance of the property for redevelopment. The CNC operated approximately 18 major industrial shops. The hazardous waste generated primarily included paint waste, waste solvents, boiler cleaning solutions, acids, sludge from metal plating at the ship pretreatment facility, and small quantities of mixed waste (radiologically contaminated hazardous waste).

The CNC corrective action program is governed by the RCRA Permit (SC0 170 022 650), issued by the SCDHEC on August 17, 1998. Appendix A of the referenced permit lists the 196 solid waste management units (SWMUs) and 209 areas of concern (AOCs) identified at the CNC that are in various stages of corrective action.

The EPA generated a National Corrective Action Priority System (NCAPS) ranking for the site in March of 1992. The result of this ranking was a high rating. SCDHEC conducted an environmental indicator (EI) evaluation of the CNC on September 18, 1997. This evaluation examined plausible human exposure, groundwater migration, surface water contamination, and whether controls are in place to prevent exposure at the facility.

III. Brief Outline of Issues Leading to an EI of NO or IN

A. CA 725

Numerous portions of the CNC have soils contamination above relevant action levels. The risk associated with these contaminant (organics, in-organics, PCBs, PAHs, and BaP) concentrations is above acceptable levels (i.e., well above 1E-6 and 1E-4) for both future industrial and residential land use scenarios. (For example: SWMU 9 is an 11 acre landfill that received industrial and domestic waste and has no cover/cap. Since the base is closed and as reuse is in progress the CNC has not provided access control to prevent trespassers from entering the referenced site)

B. CA 750

Shallow, intermediate, and deep zones of the surficial aquifer had detections of metals and solvents above their respective Maximum Contaminant Levels (MCLs). Major areas affected include the west boundary (SWMU 39) of the CNC, which is adjacent to a marsh and close to a residential area, AOC 607 in Zone F, adjacent to a residential property, SWMU 196 in Zone H discharging contamination into Shipyard Creek, and the Naval Annex property. At this stage, no controls are in place to stop the groundwater from migrating off site or to prevent access to the marsh area, Shipyard Creek, and the headwaters of Noisette Creek.

IV. Discussion of What is Needed to Get to Yes, with Schedule (a.k.a EI Interim Milestone)

A. CA725

Based on the complexity of the project and the incomplete RFI process, the CNC Tier I team used a more conservative approach to develop the attached schedule. The interim measures and focused CMS process will be used to achieve the EI of "YES".

B. CA 750

Based on the complexity of the project and the incomplete RFI process, the CNC Tier I team used a more conservative approach to develop the attached schedule. The interim measures process will be used for groundwater source and hot spot reduction. The interim measures and focused CMS process, for groundwater migration control and plume reduction, will be used to achieve the EI of "YES".

V. Level of Confidence in Meeting EI's, and Major Issues

CA725 YES	Current Human Exposures Under Controlled	Schedule 6/30/04	Actual 3/31/04
	Comment: High Confidence		
CA750 YES	Migration of Contaminated Groundwater Under Control	Schedule 3/31/05	Actual 9/30/04

Comment: Medium to High Confidence

ATTACHMENT 3

Evaluation of Indoor Air Pathway

Primary Screening - Question #1

Are chemicals of sufficient volatility ant toxicity known or reasonably Q1: suspected to be present in subsurface (e.g., in unsaturated soils, soil gas, or the uppermost portions of the ground water and/or capillary fringe-see Table 1)? (We recommended this consideration involve DQOs (see Appendix A) used in acquiring the site data as well as an appropriately scaled Conceptual Site Model (CSM) for vapor intrusion (see Appendix B).) XXX If YES - check here, check the relevant chemicals on Table 1, and continue with Question 2. The chemicals identified hare (and any degradation products) are evaluated as constituents of potential concern in subsequent questions. If **NO** – check here, provide rationale and reference below, and go to the Summary Page to document that the subsurface vapor to indoor pathway is incomplete (i.e., no further consideration of this pathway is needed); or If sufficient data are not available, go to the Summary Page and document the need for more information. After collecting the necessary data, Ouestion 1 can then be revisited with the newly collected data to re-evaluate the completeness of the vapor intrusion pathway. Rationale and References: See... **Primary Screening – Question #2** Q2 Are currently (or potentially) inhabited buildings or areas of concern under future development scenarios located near (See discussion below) subsurface contaminants found in Table 1? If YES-check here, identify buildings and/or areas of concern below, and document on the Summary Page whether the potential for impacts from the vapor intrusion pathway applies to the currently inhabited buildings or areas of concern under reasonably anticipated future development scenarios, or both (Note that for El considerations, we recommend only current risks be evaluated). Then proceed with Question 3 below. XXX If NO-check here, describe the rationale below, and then go to the Summary Page to document that there is no potential for the vapor intrusion pathway to impact either the currently inhabited building or areas of concern under future development scenarios (i.e. no further evaluation of this pathway is needed). (Note that for EI considerations, only current risks are evaluated.); or If sufficient data are not available-check here and document the need for more

information on the Summary Page. After collecting the necessary data, Question

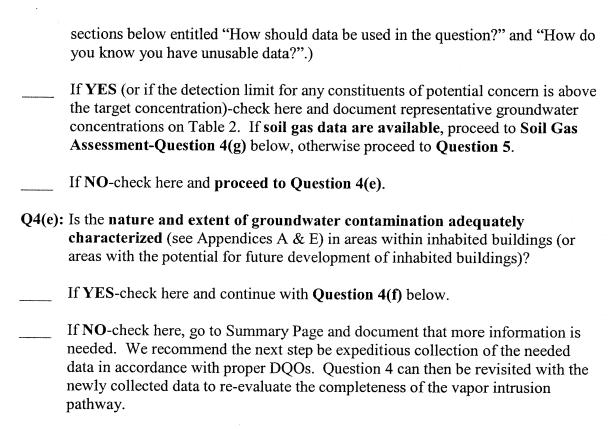
2 can then be revisited with the newly collected data to re-evaluate the completeness of the vapor intrusion pathway.

Identify Inhabited Buildings (or Areas With Potential for Future Residential Development) Within Distance of Possible Concern: In the text of the guidance for this worksheet, EPA defines an inhabited buildings as a structure designed and used for dwellings. Included in this definition are single and multi-family homes, hospitals, schools, hotels, and similar facilities. The buildings near SWMUs 163 and 166 in the Naval Annex are used by the Marine Corp Reserve for administration, maintenance, and training. They are not used to provide residents for the reservist. Therefore, these buildings do not meet the definition, for this worksheet, of inhabited.

Primary Screening Stage – Question #3

Q3.	Does evidence suggest immediate action may be warranted to mitigate current risks?
	If YES-check here and proceed with appropriate actions to verify or eliminate imminent risks. Some examples of action may include but are not limited to indoor air quality monitoring, engineered containment or ventilation systems, or relocation of people. The action(s) should be appropriated for the site-specific situation.
	If No-check here and continue with Question 4.
Ratio	nale and Reference(s):
A.	Secondary Screening - Question #4: Generic Screening
Q4(a)	: Are indoor air quality data available? (Collection of indoor air quality data without evidence to indicate the potential for vapor intrusion from subsurface source is not recommended at this level of screening, but if such data are available, we recommend they be evaluated along with the available subsurface data).
	If YES – check here and proceed to Question 4(b).
	If NO – check here and proceed to Subsurface Source identification-Question 4(c).
Q4(b)	Do measured indoor air concentration of constituents of potential concern identified in Question 1 (and any degradation products) exceed the target concentrations given in Tables 2(a), 2(b), or 2(c)?

	If YES -check here, document representative indoor air concentration on Table 2, and initiate a site-specific assessment following the guidelines in Question 6. (We recommend the user also proceed with the subsurface evaluation to evaluate whether there is sufficient evidence to indicate that elevated indoor concentrations are due to vapor intrusion from subsurface sources, and not from background or other sources).
	If NO-check here and proceed to Subsurface Source Identification-Question 4(c). (Here, the recommendation to proceed with the subsurface evaluation is based on the assumption that only limited indoor air data are available and, therefore, the available subsurface data need to be evaluated to ensure that all possible areas potentially affected by the vapor intrusion pathway are evaluated. However, in our judgment, if the site has been adequately characterized and sufficient indoor air data are available (see Question 6 for a discussion of data needs) the pathway is incomplete and/or does not pose an unacceptable risk to the human health, and no further assessment of the pathway is recommended. Document the finding as described in Question 6.)
Subsi	urface Source Identification
Q4(c)	: Is the any potential contamination (source of vapors) in the unsaturated zone soil at any depth above the water table? (In our judgment, if there is a contaminant source in the unsaturated zone, soil gas are needed to evaluate the vapor intrusion pathway in the vicinity of the source and, consequently, use of the groundwater target concentrations may be inappropriate, However, we recommend that groundwater data still be evaluated, particularly if a contaminant plume extends beyond the unsaturated zone source, but that the evaluation be performed only in conjunction with an evaluation of soil gas data. Other vapor sources that typically make the use of groundwater target concentrations inappropriate include 1) those originating in landfills where methane may serve as a carrier gas; 2) those originating in commercial/industrial settings (such as dry cleaning facilities) where vapor can be released within an enclosed space and the density of the chemicals' vapor may result in significant advective transport of the vapors
	If YES-check here and skip to Soil Gas Assessment-Question 4(g) below.
	If NO-check here and continue with Groundwater Assessment-Question 4(d).
<u>Groun</u>	dwater Assessment:
Q4(d):	Do measured or reasonably estimated groundwater concentration exceed the generic target media-specific concentrations given in Tables 2(a), 2(b), or 2(c)? (For more information on the use of data for this part, please see the



Q4(f): Are there site conditions and/or data limitations that make the use of the generic groundwater attenuation factors inappropriate? We recommend this consideration involve comparison of the generic conceptual model to an appropriately scaled and update Conceptual Site Model (CSM) for vapor intrusion (see Appendix B), as well as the proper DQOs (see Appendix A). We also recommend evaluation of the generic attenuation factors used to develop the media-specific attenuation factors (see the section below entitled "What is in Tables 2(a), 2(b), and 2(c) and how did we develop them?" and Appendix F.)

Factors that, in our judgment, typically make the use of generic groundwater attenuation factors inappropriate include:

- Very shallow groundwater sources (e.g., depths to water less than 5 ft below foundation level); or
- □ Relatively shallow groundwater sources (e.g., depths to water less than 15 ft below foundations), and one or more of the following:
 - Building with significant openings to the subsurface (e.g., sumps.
 Unlined crawlspaces, earthen floors), or
 - Significant preferential pathways, either naturally-occurring and/or anthropogenic (see discussion blow under "What Should I Keep in Mind When Evaluating Data"), or
 - O Buildings with very low air exchange rates (e.g., <0.25/hr) or very high-sustained indoor/outdoor pressure differentials (e.g., >10 Pascals).

***************************************	If YES-check here, briefly document the issues below, and proceed to Site-Specific Assessment-Question 6.
	If NO-check here, briefly document the rationale below and document on the Summary Page that the groundwater data indicate the pathway is incomplete and/or does not pose an unacceptable risk to human health. In order to increase confidence in the assessment that the pathway is incomplete, we recommend that soil gas data also be evaluated (Question 4(g)).
	If sufficient data (of acceptable quality) are not available-check here, go to Summary Page and document that more information is needed, We recommend the next step be expeditious collection of the needed data in accordance with proper DQOs. Question 4 can then be revisited with the newly collected data to re-evaluate the completeness of the vapor intrusion pathway.
Soil C	Gas Assessment:
Q4(g)	: Do measured or reasonably estimated soil gas concentration exceed the generic target media-specific concentrations given in Tables 2(a), 2(b), or 2 (c) (see Appendix D)? For more information on the use of data for this part, please see the section below entitled "How should data be used in this question?"
Tribetinessessesses	If YES (or if the detection limit for any constituents of potential concern is above the target concentration)-check here. Document representative soil gas concentrations on Table 2 and proceed to Question 5 .
	If NO-check here and proceed to Question 4(h).
Q4(h)	Is the nature and extent of soil contamination adequately characterized and has adequate demonstration been made the soil gas sampling techniques used could reasonably detect and elevated concentration of vapors if they were present in the site setting?
-	If Yes-check here and continue with Question 4(i) below.
er en	If No -check here. Skip to Summary Page and document that more information is needed. We recommend the next step be expeditious collection of the needed data in accord with proper DQOs. Question 4 can then be revisited with the newly collect data to re-evaluate the completeness of the vapor intrusion pathway.
Q4(i):	Are the site conditions and/or data limitations that may make the use of generic soil gas attenuation factors inappropriate? (We recommend that this consideration involve an appropriately scaled and updated Conceptual Site Model (CSM) for vapor intrusion (see Appendix B), as well as the proper DQOs (see Appendix A). We also recommend evaluation of the generic attenuation factors

used to develop the media-specific attenuation factors (see the section below entitles "What is in Tables 2(a), 2(b), and 2(c) and how did we develop them?" and Appendix F.))

Factors that, in our judgment, typically make the use of the generic soil gas attenuation factors inappropriate include:

- □ Shallow soil contamination vapor sources (e.g., less than 15 ft below foundation level), and one or more of the following:
 - o Buildings with significant opening to the subsurface (e.g., sumps, unlined crawlspaces, earthen floors), or
 - Significant preferential pathways, either naturally occurring and/or anthropogenic (see discussion below under "What Should I Keep in Mind When Evaluating Data"), or
 - O Buildings with very low air exchange rates (e.g., <0.25/hr) or very high-sustained indoor/outdoor pressure differentials (e.g., >10 Pascals).

 If YES-check here, briefly document the issues below, and proceed to site- Specific Assessment-Question 6.
 If NO -check here, briefly document the rationale below and document on the Summary Page that the soil gas data indicate the pathway is incomplete and/or does not pose an unacceptable risk to human health. In this case, no further assessment of the vapor intrusion pathway is recommended.
 If sufficient data (of acceptable quality) are not available-check here, go to Summary Page and document that more information is needed. We recommend the next step be expeditious collection of the needed data in accord with proper DQOs or proceed to Question 5 . When additional data are collected, Question 4 can then be revisited with the newly collected data to re-evaluate the completeness of the vapor intrusion pathway.

Rationale and References(s):

Document Risk Level Used (Circle One): 10⁻⁴, (b) 10⁻⁵, or (c) 10⁻⁶

- B Secondary Screening Question #5: Semi-Site-Specific Screening
- Q5(a): Do groundwater and/or soil gas concentrations for any constituents of potential concern exceed target media-specific concentrations by a factor great than 50? (Evaluation of limited site data in Question 5 allows the user to potential screen sites using target concentrations that are higher by a factor of up to 50 times greater that the generic target concentrations used in Question4. If observed concentrations are great than 50 times the generic target concentrations, we recommend expeditious site-specific evaluations.)

	If YES-check here and briefly document the issues below and go to Site-Specific Assessment-Question 6.
hellosida virustuaga kuna	If NO-check here and continue with Questions 5(b).
Q5(b	P:Are there site conditions and/or data limitations under which we would recommend the use of semi-site specific attenuation factors (based on the Johnson-Ettinger Model)? (To determine whether use of the Johnson-Ettinger model is appropriate, we recommend the user consider an appropriately scaled and updated Conceptual Site Model (CSM) for vapor intrusion (see Appendix B0 and DQOS (se Appendix A). We also recommend user refer to Appendix G, which lists the limitations of the Johnson-Ettinger Model.)
	Factor that, in our judgment, typically make the use of semi-specific attenuation factors inappropriate include:
	 Very shallow vapor sources (e.g., depths less than 5 ft below foundations level); or Relatively shallow vapor sources (e.g., depths less than 15 ft below foundation level) and one or more of the following:
	 Building with significant openings to the subsurface (e.g., sumps, unlined crawlspaces, earthen floors), or Significant preferential pathways, either naturally occurring and/or anthropogenic (see discussion in Question 4), or Buildings with very low air exchange rates (e.g., <0.25/hr) or very high sustained indoor/outdoor pressure differentials (e.g., >10 Pascals), or Soil types outside the range shown in Table 4, or Any other situation for which the Johnson-Ettinger Model is deemed inappropriate
	If YES-check here and briefly document the issues below and go to Site-Specific Assessment-Question 6.
	If NO-check here and continue with Question 5(c).
	If sufficient data (of acceptable quality) are not available-check here and skip to Summary Page and document that more information is needed. We recommend that the next step be expeditious collection of the needed data in accord with proper DQOs. Question 5 can then be revisited with the newly collected data to re-evaluate the completeness of the vapor intrusion pathway.

Q5(c):	Are the depth to vapor source and the overlying unsaturated zone soil type adequately characterized in areas with inhabited buildings (or areas with the potential for future development of inhabited buildings)?
	If YES-check hare and continue with Question 5(d) below.
	If NO -check here, go to Summary Page and document that more information is needed. We recommend the next step be expeditious collection of the needed data in accord with proper DQOS. Question 5 can then be revisited with the newly collected data to re-evaluate the completeness of the vapor intrusion pathway.
Subsur	face Source Identification
	Is there any potential contamination (source of vapors) in the unsaturated zone at any depth above the water table? (In our judgment, if there is a contaminant source in the unsaturated zone, soil gas data are needed to evaluate the vapor intrusion pathway in the vicinity of the source and, consequently, use of the groundwater target concentrations may be inappropriate. However, we recommend that groundwater data still be evaluated, particularly if a contaminant plume extends beyond the unsaturated zone source, but that the evaluation be performed only in conjunction with an evaluation of soil gas data. Other vapor sources that we believe typically make use of groundwater target concentrations include: 1) those originating in landfills where methane may serve as a carrier gas; 2) those originating in commercial/industrial settings (such as dry cleaning facilities) where vapor can be released within an enclosed space and the density of the chemcials' vapor may result in significant advective transport of the vapor downwards through cracks/openings in floors and into the vadose zone; and 3) leaking vapors from underground storage tanks. In these cases, diffusive transport of vapors is often overridden by advective transport and the vapors may be transported in the vadose zone several hundred feet from the source of contamination.)
]	If YES-check here and skip to Soil Gas Assessment-Question 5(f) below.
]	If NO-check here and continue with Groundwater Assessment-Question 5(e) pelow.
Ground	water Assessment:
O5(a), 1	

Q5(e): Do measured or reasonably estimated groundwater concentration exceed the target media-specific concentration given in Tables 3(a), 3(b), or 3 (c) for the appropriate attenuation factor (given that the conditions listed above in 5(b) are not present and the sampling issues described Appendix E have been considered)?

	If YES-check here, document the soil type, depth to groundwater and attenuation factor used in the assessment on the summary page, document the representative groundwater concentrations on Table 3. If soil gas data are available, proceed to Soil Gas Assessment-Question 5(f) below, otherwise proceed to Site Specific Assessment-Question 6.
	If NO-check here and document that the groundwater data indicate that the pathway is incomplete and/or does not pose an unacceptable risk to human health on the Summary Page. In order to increase confidence in the assessment that the pathway is incomplete, EPA recommends that soil gas data also be evaluated following the soil gas assessment guidelines below (Question 5(f)).
Soil C	Gas Assessment:
media attenu other	: Do measured or reasonable estimated soil gas concentration exceed the target a-specific concentrations given in Tables 3(a), 3(b), or 3(c) for the appropriate ation factor (given that the conditions listed in above in 5(b) are not present, or that site specific factors make consideration of this analysis inappropriate, and that ing issues described in Appendix E have been considered)?
	If YES-check here, document the soil type, depth to source and attenuation factor in the assessment on the Summary Page, document representative soil gas intrations on Table 3 and proceed to Site Specific Assessment-Question 6.
	If NO -check here and document that the subsurface vapor to indoor air pathway omplete and/or does not pose an unacceptable risk to human health on the lary Page. In this case, we recommend no further assessment of the vapor intrusion ay.
Ratio	nale for Selecting Semi-Site Specific Attenuation Factor and Reference(s):
Docur	nent Risk Level Used (Circle One): 10 ⁻⁴ , (b) 10 ⁻⁵ , or (c) 10 ⁻⁶
A	Site-Specific Assessment – Question 6
Q6(a)	Have the nature and extent of contaminated soil vapor, unsaturated soil, and/or groundwater as well as potential preferential pathways and overlying building characteristics been adequately characterized to identify the most-likely-to-be-impacted buildings? (Consider an appropriately scaled Conceptual Site Model (CSM) for vapor intrusion (see Appendix B) and DQOs (see Appendix A)).
	If YES-check here, briefly document the basis below and proceed to Question 6(b). If a model was used, we recommend it be an appropriate and applicable model that represents the conceptual site model. If other means were used, document how you determined the potentially most impacted areas to sample.

	If NO , or if insufficient data (of acceptable quality) are available-check here, briefly document the needed data below, and skip to the Summary Page and document the more information is needed. After collecting the additional data you can return to this question. However, if indoor air data are available go to Question 6(e) .
Q6(b)): Are you conducting an EI determination and are you using an appropriate and applicable model?
	If YES-check here and continue with Question 6(c) below.
	If NO-check here and continue with Question 6(d) below.
Q6(c)	: Does the model predict an unacceptable risk? (EPA recommends that predictive model can be used to support Current Human Exposure Under Control EI determinations without confirmatory samplings to support this determination. Current Human Exposure Under Control EI determinations are intended to reflect a reasonable conclusion by EPA or the State that current human exposures are under control with regard to the vapor intrusion pathway and the current use conditions.)
	If YES-check here and continue with Question 6(d) below.
	If NO -check here and document that the Pathway is Incomplete and/or does not pose an unacceptable risk to human health for EI determinations. However, this determination does not necessarily reflect a final decision that the site is clean without confirmatory sampling.
Q6(d)	: Are subslab soil gas data available?
	If YES-check here and continue with Question 6(e) below.
	If NO-check here and continue with Question 6(g).
Q9(e):	Do measured subslab soil gas concentrations exceed the target shallow soil gas concentrations given in Tables 2(a), 2(b), or 2(c)?
	If YES-check here, document representative subslab soil gas concentrations on Table 2, collect indoor air data and go to Question 6(g).
	If No-check here and continue to Question 6(f).
Q6(f):	Is the subslab sampling data adequate? (We recommend doing subslab sampling before indoor air sampling). Some factors we recommend for consideration in this question include:

•	Do analytical results meet the required detection thresholds? Do the data account for the seasonal and/or temporal transience Do the data account for spatial variability?
•	Is there any reason to suspect random (sampling) or systematic (analytical) error? How do the data account for the site conceptual model?
•	Was "background" ambient (outdoor) air or other vapor sources considered?
	IF YES-check here and document that the Pathway is Incomplete and/or does not pose an unacceptable risk to human health.
	If NO or unsure-check here, briefly document the needed data below, and skip to the Summary Page and document that more information is needed. After collecting the additional data, return to Question 6(e).
Q6(g)	e: Do measured indoor air concentration exceed the target concentrations given in Tables 2(a), 2(b), or 2(c)? (We recommend that before any indoor air sampling occurs: 1) an inspection of the residence be conducted, 2) an occupant survey be complete to adequately identify the presence of (or occupant activities that could generate) any possible indoor air emissions of target VOCs in the dwelling (see Appendices E, H, and I), 3) all possible indoor air emission sources be removed, and 4) that the analysis be done only for the constitutes of potential concern found on the site.)
	If YES -check here, document representative indoor air concentrations on Table 2, and go to Question 6(i).
	If NO -check here and continue to Question 6(h).
Q6(h)	Do the indoor air concentrations adequately account for seasonal variability and represent the most impacted buildings or areas (see Appendix E)? Some factors we recommend for consideration in this question include: Do analytical results meet the required detection thresholds? Do the data account for the seasonal and/or temporal transience? Do the data account for spatial variability? Is their any reason to suspect random (sampling) or systematic (analytical) error? How do the data account for the site conceptual model?
	If YES-check here, document that Pathway is Incomplete and/or does not pose an unacceptable risk to human health. If a model was used to predict the indoor air concentrations also document the relationship between the predicted concentrations and the measured concentrations.
E-Bolispinian	If NO -check here, go to the Summary Page and document that more information is needed. If the data do not account for seasonal variability, we recommend designing a sampling plan to account for seasonal variability, resample and return to Question 6(g). If the data do represent the most impacted building or area, skip

to the Summary Page and document that more information is needed. After collecting the additional data, you can return to Question 6(g).

Q6(i): Have background sources of vapor in indoor air and ambient (outdoor) air been adequately accounted for?

If **YES**-check here, document results and document that **Pathway is Compete**. If a model was used to predict the indoor air concentrations, also document the relationship between the predicted concentrations and the measured concentrations.

If **NO**-check here, briefly document the needed data below, and skip to the Summary Page and document that more information is needed. After collecting the additional data, you can return to Question 6(g).

Rationale and Reference(s):

Document Risk Level Used (Circle One): 10⁻⁴, (b) 10⁻⁵, or (c) 10⁻⁶

VII. VAPOR INTRUSION PATHWAY SUMMARY PAGE

Facility Name: Facility Address: Facility EPA ID# Updated:		Charleston Naval Complex PO BOX 190010 North Charleston, South Carolina 29406		
		SC0 170 022 560 September 16, 2003		
<u>Prima</u>	ary Screening S	Summary		
	XXX Yes	nents of Concern Identified? o, skip to the conclusion section below and check NO to indicate the pathway is inco	omplete.)	
	 Q2: Currently inhabited buildings near subsurface contamination? Yes XXX No 			
	Yes	re concern near subsurface contamination? O, skip to the conclusion section below and check NO to indicate the pathway is incomplete the pathway is incomplete.	omplete.)	
	Q3: Immedia Yes No	te Actions Warranted?		
<u>Secon</u>	dary Screening	Summary		
	Vapor source Ground Soil Insuffici	'water		
	Indoor air date Yes No	a available?		
0	Indoor air con Yes No	acentrations exceed target levels		

Subsurface data evaluation: (circle appropriate answers below)

Medium	Q4 Levels	Q5 Levels	Data Indicates
	Exceeded?	Exceeded?	Pathway is Complete
Groundwater	YES / NO / NA / INS	YES / NO / NA / INS	YES / NO / INS
Soil Gas	YES/NO/NA/INS	YES/NO/NA/INS	YES / NO / INS

NA = not applicable INS = insufficient data available to make a determination

Sit

te-S	pecific Summary
	Have the nature and extent of subsurface contamination, potential pathways, and overlying building characteristics been adequately characterized to identify the most-likely-to-be-impacted buildings?
	Yes No N/A
	EPA recommends that if a model was used, it be an appropriate and applicable model that represents the conceptual site model. If other means were used, document how you determined the potentially most impacted areas to sample. EPA recommends that predictive modeling can be used to support Current Human Exposure Under Control EI determinations without confirmatory sampling to support this determination. Current Human Exposures Under Control EI determinations are intended to reflect a reasonable conclusion by EPA or the State that current human exposures are under control with regard to the vapor intrusion pathway and current land use conditions. Therefore, if conducting evaluation for an EI determination, document that the Pathway is Incomplete and/or does not pose an unacceptable risk to human health for EI determinations.
	Are you making an EI determination based on modeling and does the model prediction indicate that determination is expected to be adequately protective to support Current Human Exposures Under Control EI determinations?
	Yes No N/A
۵	Do subslab vapor concentrations exceed target levels?
	Yes No N/A
	Do indoor air concentrations exceed target levels? Yes

A 1 -
No
110

Conclusion

Is there a Complete Pathway for subsurface vapor intrusion to indoor air?

XXX NO-the "Subsurface Vapor Intrusion to Indoor Air Pathway" has been verified to be incomplete, based on a review of the information contained in this EI Determination of Charleston Naval Complex facility, EPA ID # SC0 170 022 560 located at North Charleston, South Carolina under current and reasonably expected conditions, or based on performance monitoring evaluations for engineered exposure controls. This determination will be re-evaluated when the Agency/State becomes aware of any significant changes at the facility. YES, The "Subsurface Vapor to Indoor Air Pathway" is Complete. Engineered controls, avoidance actions, or removal actions taken include: UNKNOWN- More information is needed to make a determination.

Locations where References may be found:

Southern Division, Naval Facilities Engineering Command Caretaker Site Office 1895 Avenue F North Charleston, South Carolina

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Reminder: As discussed above, this is a guidance document, not a regulation. Therefore, conclusions reached based on the approaches suggested in this guidance are not binding on EPA or the regulated community. If information suggests that the conclusions reached using the approaches recommended are inappropriate, EPA may (at it's own initiative or at the suggestion of interested parties) choose to act at variance with these conclusions.

ATTACHMENT 4

References

References

Title	Author	Date
Project Team Notebook and	CH2M-Jones	December 2001
Instruction		200111001 2001
Background PAHs Study Report,	CH2M-Jones	February 2001
Technical Information for		2001
Development of Background BEQ		
Values		
Draft Report Preliminary RFI	EnSafe/Allen & Hoshall	15 February 1995
Field Activity (Soil-Gas,		
Geophysics)		
Final RCRA Facility Assessment	EnSafe/Allen & Hoshall	06 June 1995
Zone A RCRA Facility	EnSafe, Inc.	07 August 1998
Investigation Report		3
Final RCRA Facility Investigation	EnSafe/Allen & Hoshall	21 November 1996
Report Zone B		
Final Zones A and B RFI Work	EnSafe/Allen & Hoshall	06 September 1995
Plan		1
Zone C RCRA Facility	EnSafe	14 November 1997
Investigation Report Revision 0		
Final Zone D RCRA Facility	EnSafe/Allen & Hoshall	17 July 1997
Investigation Report		•
Final Zones D, F, and G RFI	EnSafe/Allen & Hoshall	13 June 1996
Work Plan		
Draft Zone E RCRA Facility	EnSafe	November 1997
Investigation Report		
Final Zone E RFI Work Plan	EnSafe/Allen & Hoshall	02 June 1995
Zone F RCRA Facility	EnSafe	31 December 1997
Investigation Report		
Zone G RCRA Facility	EnSafe	20 February 1998
Investigation Report		
Zone H RCRA Facility	EnSafe	5 July 1996
Investigation Report		
Zone I RCRA Facility	EnSafe	1 March 1999
Investigation Report		
Zone K RCRA Facility	EnSafe	12 September 1996
Investigation Report	:	
Zone I CMS Workplan	CH2M-Jones	25 February 2003
SWMU 1 CMS Workplan	CH2M-Jones	15 June 2001
SWMU 2 CMS Workplan	CH2M-Jones	15 June 2001
SWMU 2 IM Completion Report	CH2M-Jones	15 February 2002

SWMU 3 RFI Report	CHOM	0651 2002
	CH2M-Jones	06 February 2003
Addendum/IM Completion		
Report/CMS Workplan	CHONE	
SWMU 4 RFI Report Addendum	CH2M-Jones	28 August 2001
SWMU 5 RFI Report	CH2M-Jones	09 May 03
Addendum/IM Completion		
Report/CMS Workplan		
SWMU 6 RFI Report Addendum/	CH2M-Jones	25 June 2003
IM Completion Report/ CMS		
Workplan		
SWMU 7 Groundwater Sampling	CH2M-Jones	12 July 2002
and Analysis Plan		
SWMU 8 CMS Report	CH2M-Jones	16 June 2003
Combined SWMU 9 CMS Report	CH2M-Jones	31 January 2003
SWMU 11 RFI Report	CH2M-Jones	28 August 2001
SWMU 14 CMS Workplan/IM	CH2M-Jones	18 April 2003
Completion Report		
SWMU 15 CMS Workplan/IM	CH2M-Jones	25 February 2002
Completion Report		
SWMU 17 Interim Progress	CH2M-Jones	27 June 2003
Report MNA Pilot Test		
SWMU 18 RFI Report/IM	CH2M-Jones	09 May 2003
Completion Report/CMS		
Workplan		
SWMU 21 RFI Report/IM	CH2M-Jones	09 May 2003
Completion Report/CMS		1 2 2 2 3 2
Workplan		
RFI Report and CMS Workplan	CH2M-Jones	26 September 2002
for Combined SWMU 70		20 September 2002
CMS Report Combine SWMU 23	CH2M-Jones	23 May 2003
SWMU 24 CMS Report	CH2M-Jones	27 March 2003
SWMU 36 RFI Report Addendum	CH2M-Jones	05 March 2003
and IM Completion Report		35 March 2003
SWMU 38 IM Completion Report	CH2M-Jones	13 June 2002
(Soil Removal)		13 Julie 2002
SWMU 38 IM Completion Report	CH2M-Jones	30 September 2002
(In-Situ Chemical Oxidation of		30 September 2002
DDD in Groundwater)		
SWMU 39 Corrective Measure	CH2M-Jones	26 June 2003
Implementation Plan		20 June 2003
SWMU 42 CMS Workplan/IM	CH2M-Jones	13 February 2003
Completion Report		10 1 001441 9 2003
SWMU 44CMS Workplan/IM	CH2M-Jones	02 May 2002
Completion Report		2002
SWMU 47 CMS Workplan	CH2M-Jones	14 May 2001
<u> </u>		1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

SWMU 53 CMS Report	CH2M-Jones	18 March 2003
SWMU 54 RFI Report	CH2M-Jones	09 May 2003
Addendum/IM Completion		05 1114 2005
Report/CMS Workplan		
RFI Report Addendum and CMS	CH2M-Jones	17 June 2003
Workplan for Combined SWMU		
65		
SWMU 67 RFI Report Addendum	CH2M-Jones	19 June 2003
SWMU 81 RFI Report Addendum	CH2M-Jones	26 August 2002
CMS Report Combined SWMU 83	CH2M-Jones	01 July 2003
SWMU 84 RFI Report and CMS	CH2M-Jones	09 May 2003
Workplan		
SWMU 97 RFI Report Addendum	CH2M-Jones	04 June 2002
SWMU 100 RFI Report Addendum	CH2M-Jones	14 May 2002
SWMU 102 RFI Report and CMS	CH2M-Jones CH2M	07 February 2003
Workplan		,
SWMU 106 RFI Report Addendum	CH2M-Jones	24 August 2001
SWMU 109 RFI Report Addendum	CH2M-Jones	23 October 2001
SWMU 120 RFI Report Addendum	CH2M-Jones	06 August 2001
SWMU 136 RFI Report Addendum	CH2M-Jones	08 August 2001
Phase II		
SWMU 145 RFI Report Addendum	CH2M-Jones	01 November 2001
SWMU 159 CMS Investigation	CH2M-Jones	08 August 2001
Report Addendum		
SWMU 161 RFI Report Addendum	CH2M-Jones	24 July 2001
SWMU 162 RFI Report Addendum	CH2M-Jones	26 September 2001
SWMU 163 RFI Report Addendum	CH2M-Jones	22 March 2002
SWMU 164 RFI Report Addendum	CH2M-Jones	07 June 2001
SWMU 166 CMS Report Phase II	CH2M-Jones	02 February 2002
SWMU 170 RFI Report Addendum	CH2M-Jones	10 may 2002
SWMU 171 RFI Report Addendum	CH2M-Jones	10 May 2002
SWMU 173 RFI Report Addendum	CH2M-Jones	23 July 2002
SWMU 175 CMS Report	CH2M-Jones	07 July 2003
SWMU 181 RFI Report Addendum	CH2M-Jones	30 August 2002
SWMU 188 RFI Report Addendum	CH2M-Jones	30 August 2002
SWMU 196 CMS Report	CH2M-Jones	17 June 2003
AOC 505 CMS Workplan and IM	CH2M-Jones	30 August 2002
Completion Report		
AOCs and 523 516 IM Completion	SOUTHNAVFACENGCOM	25 May 2001
Report		
AOC 517 CMS Workplan	CH2M-Jones	16 July 2001
AOC 518 CMS Workplan	CH2M-Jones	02 July 2001
AOC 525 RFI Report Addendum	CH2M-Jones	01 November 2001
AOC 526 CMS Report	CH2M-Jones	18 March 03
AOC 528 CMS Report	CH2M-Jones	30 July 2002

AOC 530 and 531 CMS Report	CH2M-Jones	20 August 2002
AOC 537 RFI Report Addendum	CH2M-Jones	30 August 2002
AOC 538 and 539 RFI Report	CH2M-Jones	30 April 2003
Addendum		
AOC 550 RFI Report Addendum		19 September 2002
AOC 551 and 552 RFI Report		16 September 2002
Addendum		•
AOC 559, 560, 561, and 570 CMS	CH2M-Jones	20 August 2002
Report		
AOC 563 RFI Report Addendum	CH2M-Jones	26 June 2003
AOC 566 and 567 RFI Report	CH2M-Jones	04 June 2002
Addendum		
AOC 569 RFI Report Addendum	CH2M-Jones	30 December 2002
and CMS Workplan		
AOC 569 IM Workplan	CH2M-Jones	10 March 2003
AOC 570 RFI Report Addendum	CH2M-Jones	30 December 2002
and CMS Workplan		
AOC 572 RFI Report Addendum	CH2M-Jones	06 June 2002
AOC 573 RFI Report Addendum	CH2M-Jones	30 April 2003
and CMS Workplan		
AOC 574 RFI Report Addendum	CH2M-Jones	09 May 2003
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AOC 575 RFI Report	CH2M-Jones	21 August 2002
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AOC 579 RFI Report Addendum	CH2M-Jones	28 March 2002
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AOC 586 CMS Report	CH2M-Jones	26 February 2003
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AOC 597 CMS Report	CH2M-Jones	14 January 2003
AOC 598 and 599 CMS Report	CH2M-Jones	30 May 2003
AOC 605 RFI Report/IM	CH2M-Jones	09 May 2003
Completion Report/CMS		
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AOC 607 IM Completion	CH2M-Jones	18 April 2003
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Investigation Workplan		
AOC 609 RFI Report Addendum	CH2M-Jones	15 November 2001
AOC 611 RFI Report Addendum	CH2M-Jones	30 November 2001
AOC 613and 615 CMS Report	CH2M-Jones	07 February 2003